

**A MULTI-WAVELENGTH STUDY
OF THE HOT COMPONENT OF THE INTERSTELLAR MEDIUM**

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Annual Report

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This research focuses on the kinematics and evolution of the hot phase of the interstellar medium in the Galaxy. The plan is to measure the UV spectra for all hot stars observed with IUE, in order to identify and measure the main component and any high velocity components to the interstellar lines. A total of 1200 stars are candidates for inclusion in this study.

During this period, IUE spectra of 240 stars up to 8 kpc in distance, in 2 quadrants of the galactic plane, were examined to (1) estimate the total column density per kpc as a function of direction and distance, and (2) to obtain a lower limit to the number of high velocity components to the interstellar lines, thus giving an approximation of the number of conductive interfaces encountered per line of sight. By determining an approximation to the number of components per unit distance statistics were derived on the number of interfaces between hot and cold gas in the Galaxy. Twenty percent of the stars in this sample show at least one high velocity component in the C IV interstellar line.

While it was expected that the number of high velocity components detected would increase with distance, assuming a uniform population of supernova remnants, single star bubbles, and superbubbles as well as tunnels or merged structures of hot gas, I find that high velocity features to the interstellar C IV line are generally confined to known supernova remnants and superbubbles, and there is no increase of the number of interfaces with distance in these 2 quadrants. Although the resolution of IUE of 10,000 is well below current instrumentation, the large number of statistics available with this dataset allow sampling many lines of sight with a photometrically stable detector and provide a guide for future investigation.

Data Analysis

The IUE high dispersion spectra of O and B stars in or near the galactic plane ($b = \pm 20$ degrees) for 2 quadrants (2nd and 4th) were analyzed to identify and measure the main and any high velocity components to the interstellar lines. This class of stars was selected because of their strong UV continuum and, in general, lack of stellar features. The C IV features have been analyzed thus far because they are most indicative of shock structure as opposed to H II regions, and have very accurate measurements. The measurements include radial velocity of the components and the equivalent width of all detected features. The equivalent widths were used to calculate column density of the ions via a curve of growth. Only components with equivalent widths of more than 25 mÅ are considered, based on the resolution of the instrument, implying an upper limit to the detectable $\log N(\text{C IV})$ of 12.8. Distances used are from the Hipparcus catalog, where available. Otherwise, spectrophotometric distances were determined. Errors in the measurements of the equivalent widths range from 10% to 20% in most cases, although the errors can be as large as 100% when placement of the continuum was particularly difficult or the spectrum was unusually noisy.

Results thus far:

One result of the study thus far is that, at the resolution of IUE, the number of components do not increase with distance, at least for the C IV line. This is contrary to the expected result. In fact, high-velocity components are localized to specific lines of sight that can, in general, be linked to a supernova remnant or OB association superbubble. In spite of the rather low sensitivity of IUE compared with current instrumentation, the wealth of targets provides a large number of statistics that can be useful in identifying trends and placing upper limits on the column densities of shock interfaces in the galactic plane.